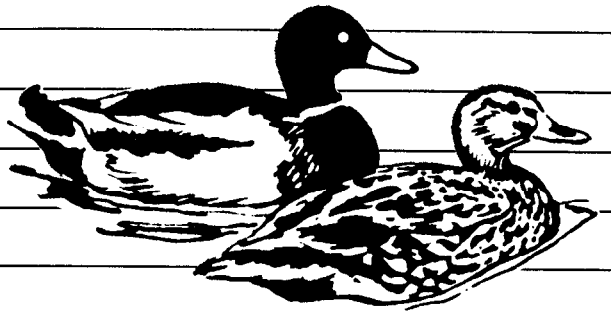
Research



Information bulletin

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FISH AND WILDLIFE SERVICE

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Comparison of Two Planting Methods for Bottomland Oaks

The extensive clearing of bottomland hardwood forests in the lower Mississippi Valley has been well documented—more than 80% of the original forests have been lost. Recently, however, opportunities have arisen to restore some of these lost forests through the Food Security Act of 1985 (the "Farm Bill"), the North American Waterfowl Management Plan, and the Administration's policy of no net loss of wetlands. To take full advantage of these opportunities, the Service and State wildlife agencies have been actively promoting reforestation methods that are less expensive than those employed by landowners interested mainly in timber production.

The two methods most often applied are planting of 1-year-old seedlings and direct seeding. In most cases, only oaks are planted, because other species will probably become established on their own. To reduce costs, planting is often done without site preparation or subsequent weed control. Although these methods are generally believed to be reliable, almost nothing has been published on the results of these reforestation efforts.

Ten Plantations Were Sampled

The Yazoo National Wildlife Refuge Complex consists of five refuges on the Mississippi-Yazoo Rivers alluvial plain in west-central Mississippi. This complex offers one of the best opportunities in the lower Mississippi Valley for evaluating this less intensive type of reforestation. In the past 8 years, 83 stands have been established, representing a range of species, establishment methods, and sites.

Five stands established by planting seedlings and five by direct seeding were randomly selected for study (Table 1). All of the selected stands were established without site preparation on fields that were in crop production for 10 or more years. Only Stand 8 had any post-planting weed control. Five species of oak were planted: cherrybark (*Quercus pagoda*), Nuttall (*Q. nuttallii*), Shumard (*Q. shumardii*), water (*Q. nigra*), and willow (*Q. phellos*).

Depending on the size and shape of each stand, one to three transects were established in each stand. Along each transect, 0.05-acre circular plots were established every 100 feet. In each plot, we located all trees and shrubs taller than 3 ft and recorded the species, diameter at breast height (dbh), and height. Because most of the seedlings in Stands 8, 9, and 10 were small, all seedlings in these stands were recorded regardless of height. Also, four 1-m^2 quadrants were set up in each plot, where tree and shrub seedlings were counted and an estimate was made of herbaceous cover.

Stocking and Growth Were Generally Higher in Planted Seedling Stands

The average stocking (excluding invading trees and shrubs) was 266 trees per acre for the five planted-seedling stands after an average of 7.2 growing

seasons, and 293 trees per acre for the five direct-seeded stands after an average of 5.8 growing seasons. The higher overall average stocking for the direct-seeded stands is deceiving, however. If stand 7 (in which nearly twice the usual number of acorns were sown) is excluded, then the average stocking of the remaining four direct-seeded stands drops to 137 trees per acre.

Diameter and height growth were clearly better for the plantations established with seedlings (Table 1). For all species combined, average diameter growth of seedling stands was more than three times as much as direct-seeded stands, and height growth was nearly twice as much. When planted on the same sites, Nuttall oak grew the fastest, followed by willow oak, water oak, and cherrybark oak.

The three stands with the lowest stocking (8,9, and 10) were on silty loam soils, which have relatively deep (>36 inches) seasonal high-water tables. Water tables this deep might result in severe drought stress during the growing season, particularly for newly germinated acorns. These same stands also tended to have the heaviest growth of weeds, making it impossible to ascertain whether weeds or dry soil conditions had the biggest impact on survival. In particular, a heavy cover of Johnson grass (*Sorghum halepense*) and goldenrod (*Solidago altissima*) seems to be associated with poorly stocked stands. These two species accounted for more than 75% of the cover in stands 8, 9, and 10.

Implications For Reforestation Projects

All 10 stands are likely to eventually meet the objective for their establishment – the restoration of bottomland hardwood wildlife habitat with a minimal investment of time and money. Overall, however, the planted-seedling stands had better stocking and growth than the direct-seeded stands and are much closer to meeting the habitat restoration objective.

Although planting seedlings usually costs twice as much (or more) than direct seeding, it may be worth the cost in any cases. For example, farmers participating in the Conservation Reserve Program may be more tempted to convert reforested areas back to crop production at the end of their 10–year contracts if survival and growth of the planted trees were poor. This research indicates a need for more extensive comparative studies of direct seeding and planting seedlings across a range of species and site conditions.

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Table 1. Stocking and growth of planted oaks

Stand	Species	Age[a]	Stocking (No./acre)	Mean dbh (inches)[b]	Mean height (ft)
			Planted Seedling Stands		
1	Nuttall	6	300	2.3	19
2	Cherrybark	8	60	0.5	5
	Willow		206	1.3	11
			266		
3	Nuttall	6	248	1.2	9
4	Cherrybark	8	35	1.2	10
	Water		168	2.0	16
	Willow		113	2.3	17
			316		
5	Cherrybark	8	16	0.5	4
	Water		177	0.9	9
	Willow		7	1.1	9
			200		
			Direct-Seeded Stands		
6	Nuttall	6	201	0.3	5
7	Nuttall	8	12	0.8	8
	Water		438	0.5	7
	Willow		464	0.6	7
			914		
8	Shumard	6	160	0.3	4
9	Shumard	5	102	0.3	3
10	Water	4	87	0.2	2

[a] Number of full growing seasons.
[b] Diameter at breast height of trees taller than 4.5 ft; trees of this height made up less than a third of the total stems in Stands 8, 9, and 10.